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ABSTRACT

Instructional objectives are rarely supported by the delineation of alternate modalities for achieving those objectives. Both are necessary for the development of an individualized educational program. Learning research suggests nine general criteria for the selection of appropriate modalities: (1) the amount of immediate positive reinforcement provided, (2) the amount of active student participation, (3) the degree of congruence between the exercise and the expected behavior, (4) the lack of reinforcement for undesired behavior, (5) the degree to which the response-judging capabilities analyze a full range of responses and errors, (6) the degree to which the medium insures that students will respond overtly before checking the correct answer, (7) degree to which medium accommodates variety in individual backgrounds, (8) the degree of accommodation of individual rates of learning, and (9) the degree of individual access to the medium. An administrative structure for assisting instructors in the choice and use of various modalities is another important feature in implementing individualized programs. Instructional systems support should function in accordance with an overall plan and philosophy. (KB)

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INSTRUCTIONAL SYSTEMS DELIVERY--CHOICE AND IMPLEMENTATION IN ACADEMICA

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Instruction Systems Delivery within the formal education setting, from kindergarten through undergraduate, gradute, professional and continuing education must address two major problem areas. The first area involves the choice of appropriate instructional delivery systems or modalities for each educational situation. Criteria for choice need to be developed and various modalities need to be mapped against these criteria so that strengths and weaknesses of each modality can be readily seen. The second problem area involves instructional delivery support systems. Such systems must be established not only to facilitiate the execution and/or implementation of the modality chosen, but also to provide an appropriate menu of modalities from which to choose.

For the future, any new instructional modality, computer based or other, should be evaluated in light of a set of criteria based on research in learning (the seeds of which are discussed herein). Initially, we cannot expect to ascertain a set of totally valid criteria, much less a set of "ideal" criteria. Much research in the comparative effectiveness of delivery systems has yet to be done.

Via delineation and application of some simple principles of implementation it is hoped that instructional systems support and delivery will function in accordance with an overall plan and philosophy rather than as the sum total of the plans of several modality advocates or production centers. The net effect should be (a) increased efficiency and effectiveness in utilization of various modalities and (b) resultant improvements in the quality of the instruction rendered via use of the modalities.

This paper attempts to (a) delineate criteria for choice of instructional modalities and (b) propose principles for an administrative structure which would foster this choice and provide an environment for subsequent implementation of the choice in the academic setting. Supporting papers discuss technology-oriented instructional systems delivery at each level of the formal educational process, from primary to secondary, to undergraduate, to graduate, to professional and to continuing education. Each encompasses one or more of the tenets discussed in this paper.

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INTRODUCTION

Instruction Systems Delivery within the formal education setting, from kindergarten through undergraduate, graduate, professional, and continuing education must address two major problem areas. The first area involves the choice of appropriate instructional delivery systems or modalities for each educational situation. Criteria for choice need to be developed and various modalities need to be mapped against these criteria so that strengths and weaknesses of each modality can be readily seen. The second problem area involves instructional delivery support systems. Such systems must be established not only to facilitate the execution and/or implementation of the modality chosen, but also to provide an appropriate menu of modalities from which to choose.

The need to concurrently address both problem areas in considering any instructional system is evident. We cannot, for example, stop all development and experimentation with various delivery systems and modalities (e.g. networking and computer assisted instruction CAI) while we establish criteria against which to measure the "goodness" or "badness" of the system and the modality in a given educational setting. Nor can we ignore the establishment of criteria for evaluation of modalities and delivery systems while we busily develop and promulgate various modalities.

How many times have you observed an instructional setting where a particular technology (i.e. television, language laboratories, or computers) because of its availability is applied to every problem which arises? This syndrome of a solution looking for a problem occurs all too often where one modality or instructional system is overlaid on an entire instructional process without discriminate analysis of alternative modalities. All too often the "medium has controlled the message"* and has kept us from an objective assessment of the effectiveness of the medium (modality) in meeting our instructional needs.

CHOICE OF THE APPROPRIATE INSTRUCTIONAL MODALITY

How many times have you participated as a student in a formal educational situation where the instructor linked each instructional objective to alternative modalities or learning resources? How many times have you particpated in a formal educational situation where each instructional objective (generally stated in terms of expected learner behavior) was further supported by delineation of alternate modalities for each component part of the teaching-learning process.* Certain modalities will facilitate one component (i.e. text or lecture for initial presenation of materials) and be inappropriate for others (i.e. lecture for drill and practice). The component parts are:

1. initial presentation of materials related to attainment of the objective (text, lecture, etc.);
2. drill and practice relating to materials presented (written exercises, programmed instruction exercises, computerized simulations, etc.);
3. evaluation or assessment of knowledge of the materials presented (written examinations, computerized examinations, oral examinations, etc.); and
4. reteaching where necessary (individualized tutorials, computerized dialogues, etc.).

Most us us will honestly answer never to both questions. As learners, we are lucky to receive detailed instructional objectives; much less a detailed analysis and presentation of learning modality options for helping us to achieve these objectives. To receive a further delineation of learning modality options by component part of the teaching-learning process would be almost beyond our comprehension.

Take this example one step further, and imagine the addition of time independence in the learning system--not only would objectives be delineated with careful consideration given to selection of instructional modalities which best facilitate the instruction, but also attention would be given to each individual learners rate of movement through the objectives in the learning process so as to allow for differences in rate;comprehension,and retention of what is learned. Such a time independent system becomes possible when:

1. objectives are delineated, and
2. the availability of alternative modalities (especially technology oriented ones) free the educational setting from the structure imposed by more traditional modalities (i.e. group lectures).

*A paraphrase of a concept first attributable to Walt Kelly in "Pogo" and latter to Marshall McLuhan in his book, The Medium is the Message.

*As described here, this process assumes that one is working from an instructional objective written in terms of expected measurable behavior change.

Although somewhat Eutopian in nature, the above scenario sets a target which, given current learning technologies, is not beyond reach. Educational systems which begin to approach the target are described in the supporting papers for this session and thus, will not be iterated here. These papers address all levels of education from primary and secondary education to professional and continuing education.

In summary, the choice of an instructional modality must:

1. be linked to a given instructional objective (only when linked to an instructional objective can a given modality be evaluated for effectiveness);

2. be linked to the appropriate component of the teaching-learning process; and

3. be made in light of broader curricular considerations (i.e. variation of modalities or optimal combination of modalities across objectiveness within a curricular area).

Given the above three axioms related to the choice of appropriate modalities, what specific criteria will give us the guidelines necessary to make appropriate choices? Three levels of criteria become apparent:

1. What criteria help us assess the relative merit of a modality in and of itself?

2. What criteria help us judge the relative merit of a modality when linked with a particular behavioral objective and component part of the learning system?

3. What criteria help us judge the relative merit of a medium when linked with a particular behavioral objective and a given individual learner?

It is my feeling that each of the three criteria levels builds upon criteria of the previous level. For this reason and given the magnitude of the task encompassed in attempting to delineate criteria at all three levels, only the first level will be addressed specifically here.

Delineation on Criteria

Given the advent of numerous technological advances such as language laboratories, tape recorders and players, film projectors, audio and video tape players, programmed instruction, and most recently, computers, the domain of instructional media from which teachers can choose has expanded greatly. Never before has the educator had such a rich variety of instructional mediums at his disposal. Yet, these advances have had less than major impact on learning in the academic setting. In his supporting paper, Dr. Allen notes that part of the reason for this situation is the failure of educators in applying research on learning to the operational educational setting. I would further speculate that the application has not occurred in the classroom because teachers have not been appropriately educated as to the choices nor criteria for making such choices. Dr. Allen's initial criteria are paraphrased here and other criteria are added to form a set of initial criteria. Each is drawn from research on learning. A high rating on all criteria would provide the most desirable modality. The criteria are:

1. amount of immediate positive reinforcement provided;

2. amount of active student participation in the learning process;

3. degree of similarity of the exercise (permitted by a delivery system) with the actual behavior expected;

4. degree to which the instructional medium avoids reinforcement of undesired behaviors (i.e. by rejecting unequivocally unanticipated answers do certain modalities teach students that creativity is undesirable?);

5. degree to which the response judging capabilities analyze a full range of responses and determine what kind of errors have been made (assuming that the modality judges the response of the student);

6. degree to which the modality assists in insuring that the student will respond overtly or otherwise commit a response before checking the correct answer (assuming the modality does not judge the response, but requires the students to judge his own response in order to get feedback);

7. degree to which the modality allows for individual rates, comprehension, and retention of what is learned;

8. degree to which the modality allows for accomodation of differences in individual backgrounds (i.e. prior experience, prior training); and

9. degree to which the modality allows for access by the learner when and where needed (i.e. taking instruction to the individual).

Dr. Allen notes "apart from the many attributes for the delivery system (modality)* which will determine its appropriateness for each instructional situation. . . there are also the practical constraints which, however mundane, must be considered. Cost, availability, reliability and the like are obvious and will hopefully be considered without encouragement here." In addition, the dynamic nature of any learning environment, and of the modality itself, must be considered as new technologies become available, and as other requirements in the educational delivery systems change.

It is not intended that the above serve as an ultimate set of criteria for choosing modalities; it is my hope that they serve as a framework and starting point for further work. Take a moment and use the above criteria to rate language laboratories . . . CAI . . . lectures. . . .

Summary

For the future, any new instructional modality, computer based or other, should be evaluated in light of a set of criteria based on research in learning (the seeds of which are offered above). Initially, we cannot expect to ascertain a set of totally valid criteria, much less a set of "ideal" criteria. Much research in the comparative effectiveness of delivery systems has yet to be done. As Dr. Allen notes:

> "With the many delivery systems (modalities)*now available, ranging from such staples as printed materials and classroom presentations through the tyranny of language laboratories and tape recorders to the awesome potential of computer-based instruction, the selection and proper utilization of delivery systems is a formidable task. Much more than is presented in this paper must be considered. . . . it is demonstrably true that delivery systems (modalities)* can be more effectively designed and more objectively selected than ever before. Why aren't we doing it?"

IMPLEMENTATION OF INSTRUCTIONAL MODALITIES

The second major problem area which must be addressed in instructional systems delivery is the actual implementation of the concepts espoused above. By implementation I mean:

> operationalization in the academic setting of a mechanism to encourage and support intelligent choice, and
>
> 2. provision of the various modalities so that the teacher has a full range of options from which to choose and operate.

Implementation of the simple support system for the chalkboard involves availability of chalk, delineation of colors needed, availability of erasers, cleanliness of boards and erasers, etc. Support systems for technologies such as computer assisted instruction involve more complex and elaborate considerations (communications systems, computers, terminals, software, user's guides, teacher training, troubleshooting, etc.). The complexity of implementing and operating high technology-oriented instructional delivery systems is addressed by Morgan (1976), Merola (1976), Harless (1976) and by Pengov (1974-a & 1975). Rather than delve deeply into the many facets of delivery support systems (i.e. teacher training, resource management, user access facilitation, system evaluation), this paper will focus on guidelines for an administrative structure for assisting instructors (a) in making the choice of modality and (b) in accessing the learning modality once chosen.

Principles which should be considered in the development of an administrative structure are:*

1. The area of instructional systems support and delivery requires high level administrative support and, in most cases, is best placed centrally so as to allow for coordination with existing colleges, departments, and/or other instructional units. The desire is for central coordination without central control.

2. Instructional systems support and delivery should encompass:

   - Instructional Production
   - Instructional Distribution
   - Instructional Research, Development, and Evaluation
   - User Education and Orientation in Selection and Use of Modalities

3. The area of instruction systems support and delivery should devote primary emphasis to viewing learning modalities from a user perspective rather than from a modality-production perspective.

4. The area of instructional systems support and delivery should provide a single "point of contact" for users

*Editorial insert.

*These principles are drawn primarily from Bunderson (1974) and Pengov (1974-b).

in need of assistance with learning modalities and/or resources. Such assistance should cross modalities.

5. The area of instructional systems support and delivery should serve as a clearing house unit to coordinate and disseminate information regarding learning modality development, usage and evaluation.

6. The area of instructional systems support and delivery should foster a team relationship between instructional designers, developers, and subject matter experts with adequate funding arrangements to accomplish viable and self-sustaining instructional development. Continual attention must be given to development of new incentives for professionals in both the learning resource area and the content area. The issue of incentives is particularly important for faculty members in the higher education setting where the reward system usually lies outside of instructional development.

Via application of the above principles it is hoped that instructional systems support and delivery will function in accordance with an overall plan and philosophy rather than as the sum total of the plans of several modality advocates or production centers. The net effect should be (a) increased efficiency and effectiveness in utilization of various modalities and (b) resultant improvements in the quality of the instruction rendered via use of the modalities.

SUMMARY

This paper has attempted to (a) delineate criteria for choice of instructional modalities and (b) propose princples for an administrative structure which would foster this choice and provide an environment for subsequent implementation of the choice in the academic setting. Supporting papers discuss technology-oriented instructional systems delivery at each level of the formal educational process, from primary to secondary, to undergraduate, to graduate, to professional and to continuing education. Each encompasses one or more of the tenets discussed in this paper.

In the words of another, however, 'we have only just begun.'

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